




DESERTEC – Clean Power from Deserts

A concept for energy security and climate protection
for a world with 10 billion people

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In 2050, the world's population will need 3 planets to cover it's demand for resources



2

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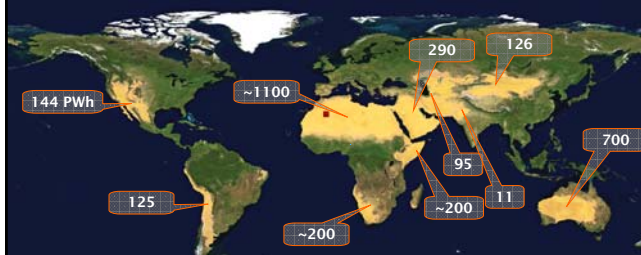
How can 10 billion people live peacefully together on just one planet?



3

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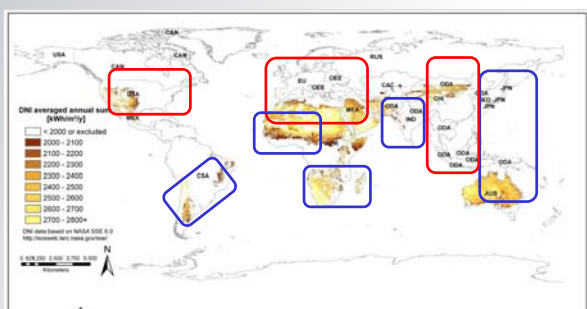
Desert Potential: 3000 PWh/y Energy is abundant



Annual economic potential, in PWh (= 1000 TWh)
Global demand (2008): 18 PWh/y Source: Trieb et.al., DLR, 2009

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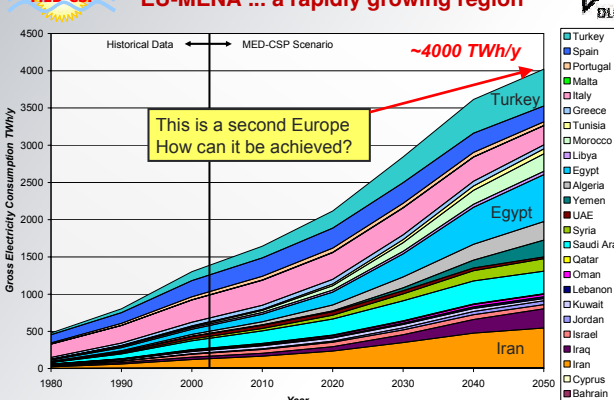
Potential DESERTEC regions



Source: Gerhard Knies

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MED-CSP EU-MENA ... a rapidly growing region



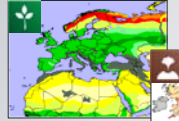
This is a second Europe
How can it be achieved?

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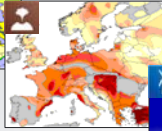
The DESERTEC Concept for EU-MENA

DLR Studies: renewable energy potential in the EU and in MENA

Biomass: 1,350 TWh/y

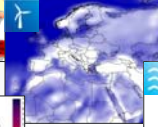


Geothermal: 1,100 TWh/y

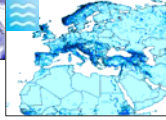


Electricity demand in EU-MENA in the year 2050: 7,500 TWh/y

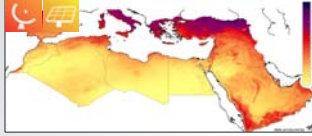
Windpower: 1,950 TWh/y



Hydropower: 1,350 TWh/y



Solar power: 630,000 TWh/y



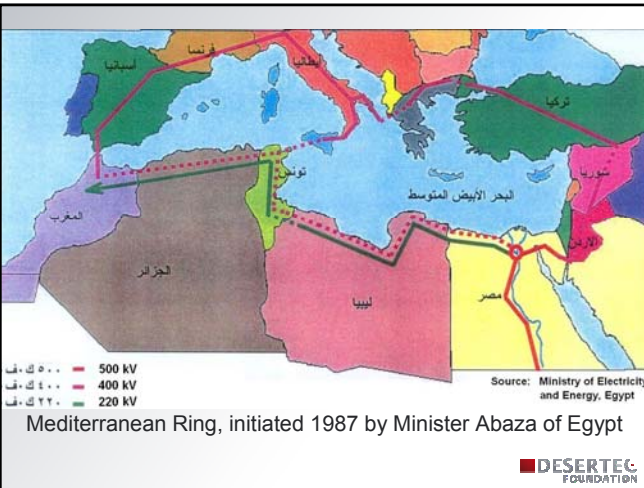
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Vision for 2050

3 Samples out of 20 EU-MENA HVDC interconnections each line transmitting 5 Giga Watt



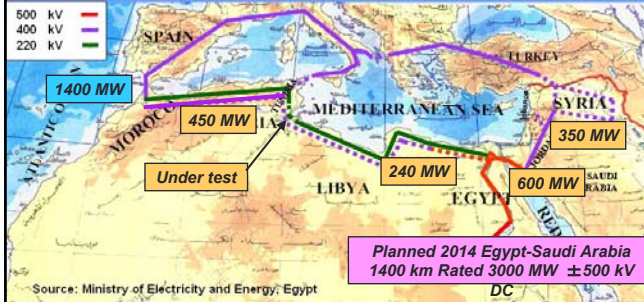
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Mediterranean Ring, initiated 1987 by Minister Abaza of Egypt

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Situation 2010 with 220/400 kV AC Lines



Peak load management: in Saudi Arabia noon peak and in Egypt evening peak

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The DESERTEC Concept for EU-MENA

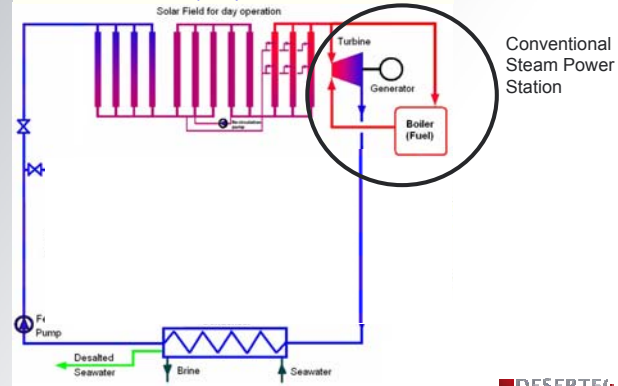
The best sites offer the greatest benefit for climate protection

- For the same investment, the best sites can produce more clean electricity and therefore replace more conventional power
- Solar energy especially in the south, wind power in coastal areas, hydropower in the mountains, biomass in fertile central Europe, geothermal as available



Solar Hybrid Power Station with Desalination

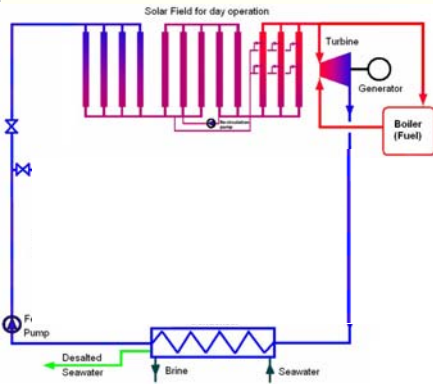
Desalination (MED) with Waste Heat



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Solar Hybrid Power Station with Desalination

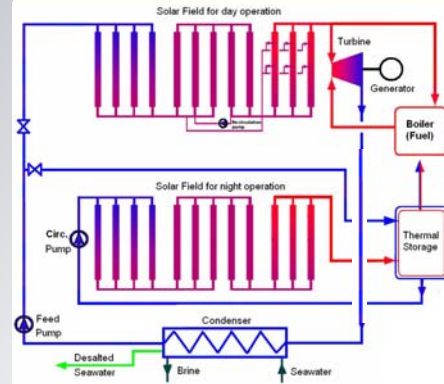
Desalination (MED) with Waste Heat



Step 1:
Solar field
in Hybrid
operation for day
and night service.
Solar share ~30%

Solar Hybrid Power Station with Desalination

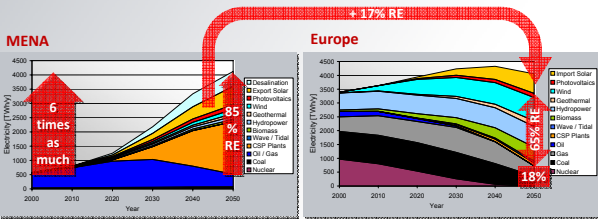
Desalination (MED) with Waste Heat



Step 2:
Solar field
with Heat
Storage for Night
operation + boiler
as back up.
Solar share
~99% & ~1%
bio-fuel for days
or clouds

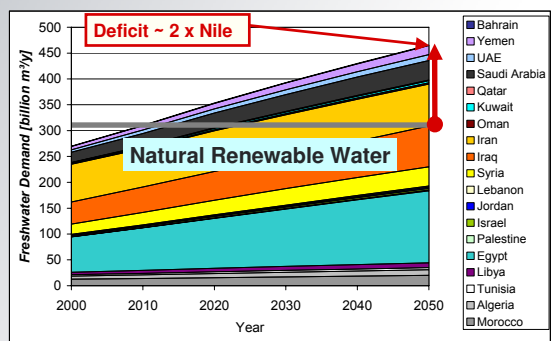
Electricity production scenario for EU and MENA

DLR Studies: Clean power from deserts for local demand and export



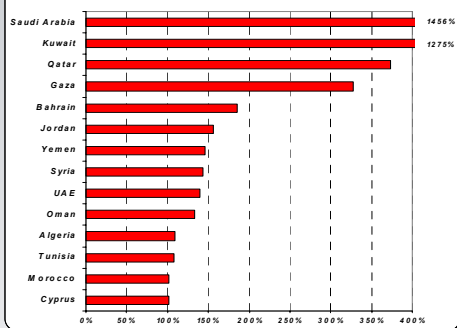
- MENA: Power from deserts mainly for local electricity demand and desalination
- Europe: Expansion of domestic renewable energies
- Dispatchable desert power complements the European electricity mix, enabling a higher proportion of PV & Wind, thus quickening the shift to a renewable energy supply

Freshwater Demand Prospects by Country



Source: DLR, Trib

Groundwater withdrawals as percentage of safe yield



Groundwater withdrawals exceeds safe yield
Saghir 2000

Desertification of Soils due to Groundwater Over-exploitation and Salinization (e.g. Bahrain)

Source Dr. Waleed Zebari, Arabian Gulf University

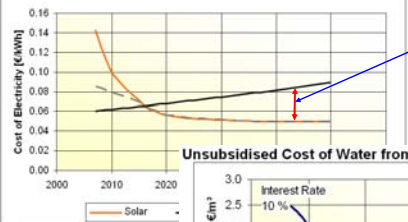


1960's

1980's

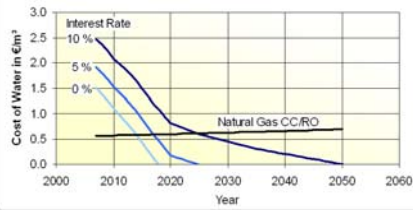
1990's

Unsubsidised cost of electricity of CSP versus natural gas CC



This difference is used to support water desalination

Unsubsidised Cost of Water from CSP versus Natural Gas CC/RO



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Reducing cost of water from CSP/MED plants

Tunis, 30 Oct. 2010

DESERTEC UNIVERSITY NETWORK



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UNIKASSEL
VERSITÄT



www.menarec.org/remena.html

DAAD

Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

Cairo University

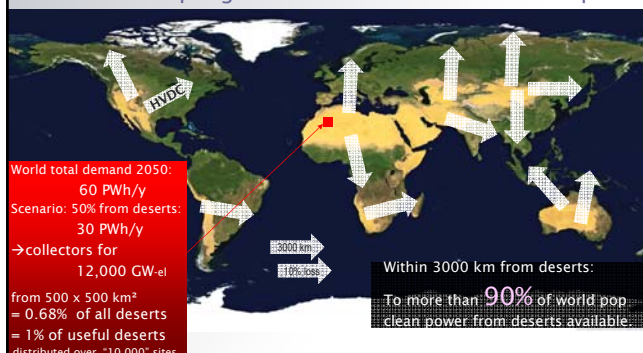


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DESERTEC-WORLD

12,000 solar GigaWatt from Deserts

via HVDC super grid to a World with 10 billion People



Source: Gerhard Knies

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The DESERTEC concept for 10 billion people

- Responsibility when managing the remaining resources
➢ **Education for wise Resource Management**
- All peoples of the earth shall have a realistic chance for development.
➢ **Energy for Development**
- Collect energy from the deserts, as it is abundant and not used
➢ **The Sun gives in 6 hours the Energy used in one year**
- Transport the collected energy from the deserts over long distances to the users
➢ **Via HVDC, an available technology**
- Produce potable water by desalination to satisfy food demand
➢ **Clean Electricity and use of Waste Heat for Desalination**

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What can we do to foster Development of MENA?

- Long term power purchase agreement to supply clean Energy from MENA to EU
- MENA shall shift subsidies from Oil/Gas for electricity production to subsidising delivered electricity, giving priority to locally produced components.
- Ground an EU-MENA company that builds HVDC lines between EU and MEAN.
- Ground an EU Company that that buys clean electricity from MENA and sells it to the EU grid.
- Agree that the delivery of electricity is coupled with a reasonable amount of desalted seawater:
e.g. 20-40 m³ for each MWh delivered electricity.

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